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ABSTRACT

This study was designed to pursue the question of the relationship between enablement, alienation, and attitude toward science in the seventh and eighth grades. Subjects are 2,159 students taught by 19 teachers in 4 middle schools. There are strong relationships between student perceptions of classroom structure and their attitude toward science. If they see themselves as having a great deal of control over events in the classroom, and are less alienated, they have a much better attitude toward science. Boys feel less empowered than girls, and classes taught by male teachers report themselves to be less in control than those taught by females. Attitudes of students with female teachers are more positive that those taught by males. The well documented decline in attitude from the first through the eighth grade might be at least in part the result from a shift from student-centered to teacher-centered classroom climate that seems to be part of the structure of elementary schools. (Contains 34 references.) (Author)

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ENABLEMENT, ALIENATION, AND ATTITUDE TOWARD SCIENCE IN MIDDLE SCHOOL CLASSROOMS

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Abstract

This study was designed to pursue the question of the relationship between student enablement, alienation, and attitude toward science in the seventh and eighth grades. Subjects are 2,159 students taught by 19 teachers in four middle schools.

There are strong relationships between student perceptions of classroom structure and their attitude toward science. If they see themselves as having a great deal of control over events in the classroom, and are less alienated, they have a much better attitude toward science.

Boys feel less empowered than girls, and classes taught by male teachers report themselves to be less in control than those taught by females. Attitudes of students with female teachers are more positive than those taught by males.

The well documented decline in attitude from the first through the eighth grade might be at least in part the result of to a shift from student-centered to teacher-centered classroom climate that seems to be part of the structure of elementary schools.

Introduction

Earlier studies in our research program documented a precipitous decline in attitude toward science from the first to the eighth grade (Baker, Hill, Leary, Moffat, Piburn, Sidlik, Trammel & Wallen, 1992). Young children were generally very positive about science, although they might not know much about it. By the end of the elementary school years, science was disliked by most.

Correlations between attitude and achievement are typically low (Piburn, 1992), and probably for this reason data on attitude either are not collected or are overlooked by schools. We do not share this disinterest, and deplore a situation where students, however much they may learn, turn away from the subject. For us, the decline in attitude was disturbing enough to warrant the conduct of a further investigation into curricular and classroom characteristics that contribute to the progressive alienation of students.

The results of a program of interviews (Piburn & Baker, in press) yielded a variety of variables that appeared to be very influential to the formation of attitude. Perhaps most salient to us was the perception of students that their ideas were not being considered in matters of course content and delivery. They began their school years feeling that science suited them well but, as time passed, became increasingly estranged, and ultimately concluded that science had been "ruined" for them.

Thus, we were led to consider the role of two dimensions of classroom climate in the formation of attitude. The first was the degree to which students felt that their points of view were known to their teacher, and taken seriously, and reflects a classroom trait of student access, or enablement. The second reflected the extent to which students do not understand the nature of classroom rules and tasks, feel that they are not treated equally, and become increasingly isolated and alienated.

Just as attitude declined from earlier to later grades, so did students' feelings of enablement. And, in an inverse manner, the degree of alienation increased so that, by the eighth grade students were disenfranchised and dissatisfied (Baker, et al., 1992). This led us to the current study, of the relationships between middle school students' perceptions of the enabling or alienating structure of their classrooms and their attitudes toward science.

Literature Review

Classroom climate

Studies of classroom climate have their roots in the work of Kurt Lewin and field theory. Lewin claimed that both the personality characteristics of individuals and their interactions with the environment are powerful determinants of behavior. H.A. Murray followed this line of research with his needs-press model. Needs refer to personal, motivational qualities that move the individual in the direction of goals, while environmental press provides the

situation through which the expression of personal needs is either supported or hindered.

More recent research on the topic has utilized constructs similar to those of personal needs and environmental press, and the interaction between the two, to describe classroom climate. For example, Walberg (1968) defined climate as an interaction between affect (idiosyncratic, personal dispositions) and class structure (democratic, heterogeneous, stratified, and group-sanctioned behavior). As part of the evaluation of Harvard Project Physics, he and his colleagues developed the Learning Environment Inventory (LEI) for use with high school students. Subsequently, a parallel version of the instrument, the My Class Inventory (MCI), was designed for use with elementary school students (Fraser, Anderson & Walberg, 1982).

Quite independently, but at approximately the same time as Walberg, Moos (1968) began his assessments of institutional climate, beginning with prisons. His Classroom Environment Scale (CES) emphasized three dimensions of classroom climate (Tricket & Moos, 1973); relationship (involvement, affiliation, teacher support), personal development (task orientation, competition) and system maintenance and system change (order and organization, rule clarity, teacher control, innovation). A major advance in the work of Moos was to provide separate measures to assess student perceptions of actual and preferred classroom climate.

The final instrument commonly used in the assessment of classroom environments is the Individualized Classroom Environment

Questionnaire (Fraser, 1985). It contains 50 items divided among five subscales; personalization, participation, independence, investigation and differentiation. Using the system of Moos as a referrent, Fraser and Fisher (1986) place the first two into the dimension of relationship, the next two into personal development, and the final subscale into the dimension of system maintenance and change.

Anderson, Walberg and Welch (1969) examined the effects of different curriculums on the social climate of learning in a physics course, and explored the differences between learning climates of classes taught by teachers with or without much prior experience teaching physics. They found that less experienced teachers are perceived as more democratic and intimate, with less friction and favoritism. Perceptions of internal friction occurred in cases of disorganized and stratified class structure.

Course content also has an effect on the social climate of the classroom. Science classes were perceived as fast-moving and formal, whereas Humanities classes were seen as disorganized and easy (Anderson, 1971). Yamamoto, Thomas and Karns (1969) found that junior high math and science classes rated high on "Vigor"(alive, strong, fast), while language arts was characterized by "Certainty" (safe, easy, and usual).

Gender effects

There are gender differences in the perception of classroom environments. Ahlgren and Johnson (1979) found support for the

popular stereotype that males are more competitive and less cooperative than females. From grades 2 through 12, females reported more positive attitudes toward cooperation, and less positive attitudes toward competition. This preference for cooperative environments in girls was strongest in grades 8, 9, and 10. Ahlgren (1983) demonstrated that cooperative and competitive classroom environments had differential effects on the attitudes of males and females. In grades 2-4, competitive attitudes show some positive correlation with school attitude for boys only. By grades 11-12, correlations between competition and attitude are positive for both boys and girls although girls retain some negative attitudes toward competition, and identify their own personal worth with cooperation.

Teacher gender appears also to be a significant factor in creating a classroom climate. In the fourth grade, climate in classes taught by males and females are similar. However, by seventh grade, both males and females see classes taught by female teachers as having more friction (Lawrenz, 1987). They are perceived as more formal, more goal directed, more diverse and demonstrating favoritism (Lawrenz & Welch, 1983). However, it is hard to reconcile these data with earlier results indicating that female teachers are more interested and receptive to change (Welch & Lawrenz, 1982). The fact that male teachers are perceived as more difficult is consistent with earlier evidence that they score higher on measures of knowledge (Welch & Lawrenz, 1982).

Achievement and attitude

Comparisons of classroom climate and achievement typically show low to medium order relationships between the two. Talton & Simpson (1987) found correlations between a three-item subscale measuring classroom climate and scores on teacher made tests that ranged between .17 and .44. Similar results are reported by Fraser (1989). Work by Anderson and Walberg (1974) indicated that as much as 30% of the variance in achievement might be attributed to variance in classroom climate.

Walberg and Anderson (1968) demonstrated that students with various perceptions of classroom climate grew in different ways during a course. High-achieving physics students perceived their class as socially homogeneous, with groups working together to achieve a goal. Those students who gained in science understanding saw their class as well organized, with little friction between class members. Walberg and Anderson also found that certain groups or climate variables predicted learning better than others. A class that was well organized and in which students were treated equally produced more learning than one designed around compulsive restraint or coercion.

Fraser and Fisher (1982, 1983) hypothesized that a positive relationship existed between a student's achievement and whether the class environment was in line with what the student actually preferred. Their results confirmed that the congruence of actual/preferred class environment was important for student

achievement. Class achievement could be increased by bringing the actual class environment and the preferred class environment closer together. Fraser and Rentoul (1980) that achievement was mediated by the individual student's preference for classroom openness, if the student was taught in an open classroom environment.

Several studies have examined the effects of environment on attitude. Simpson and Oliver (1990) found that across grades six to ten, class climate, other students, and friends were significant predictors of a student's attitude toward science. Lawrenz (1976) showed that the nature of the learning environments does appear to correlate to student attitude toward science, and accounts for about 30% of variance in mean classroom scores on the Science Attitude Inventory. Talton and Simpson (1987) argued that classroom environment variables predicted the greatest amount of variance in attitude toward science in all grades.

Myers and Fouts (1992) examined the types of science classroom environments in 27 high school science classrooms, and and their relationship to attitudes toward science. Using cluster analysis, they found that the 27 classrooms clustered into three groups. The cluster in which students displayed the most positive attitudes toward science was characterized by high student involvement, strong positive relationships between classmates, personal support from the teacher, task oriented, and where there were well-established rules and organization. Classes in the cluster with the next highest positive attitudes toward science were characterized as having a low

level of student involvement, but moderately strong positive relations among classmates. The classes were task oriented, competitive with good rule clarity, but the order and organization of the classrooms was low. Classes that displayed the lowest positive attitude toward science showed little student involvement, moderate positive relations between classmates, moderate levels of competition and organization with clear rules, and a teacher who was in firm control of the classroom. The most influential classroom environment variables were those primarily related to the teacher. More negative attitudes toward science were found where the teacher had a great deal of control over the class.

Statement of the Problem

This study was conducted as an extension of an on-going research program into the origins of attitude toward science, and of gender differences in attitude (Baker, et al., 1992; Piburn & Baker, in press; Piburn, Sidlik & Mulvonen, 1992). In particular, it addresses the relationship of gender of teacher and student and perceived classroom climate to attitude toward science. It is addressed to the middle school because of prior evidence that attitude is lowest at that grade of any point during the school years.

A significant relationship was expected between climate and attitude, with the best attitudes occurring in classes perceived as high in student enablement (good interpersonal relationships, high student involvement and classroom organization). Prior research did

not allow unequivocal predictions regarding gender differences, particularly with regard to the teacher. There was some indication that attitudes might be better for males in competitive environments, and for females in cooperative environments, and that female teachers might not be seen as favorably as male teachers.

Method

Subjects for this study included every student in all seventh and eighth grade science classrooms in a large suburban school district. These were 2,159 children taught by 19 teachers in 84 classes and four middle schools. Of the students, 1,104 were female and 1,055 male. Six teachers were female and 13 were male. Forty-one of the classes were seventh grade and 43 were eighth grade.

The community from which this sample was drawn is suburban and predominantly white, middle and upper middle class, with less than 10% minorities overall. However, two schools which were sampled documented minority populations of 33% each. The district currently serves a Yaqui indian community and a growing hispanic population. Fourteen percent of the students are categorized as special education, and 10% as gifted.

The attitude measure used in this study was a 20 item revision of a longer instrument, titled Individual and Group Attitudes Toward Science, that was developed during an earlier phase of this research program (Piburn, Sidlik & Mulvenon, 1992). Responses were along a 10 point Likert scale ranging from agree to disagree. Coefficient alpha

for the long form, with a sample of 1,084 subjects, was 0.57. Coefficient alpha for the revised 20 item instrument, with the sample used in this study, was 0.67.

The second instrument was a revision of a Measure of Classroom Structure that was constructed during earlier studies (Baker, et al., 1992). It consists of two subscales; agreement with the first indicates that students feel empowered in classroom decision making; agreement with the second implies an environment of insecurity and competition (Figure 1). These subscales have been named Enablement and Alienation. Coefficient alpha, with this sample, for the first scale was 0.76, and for the second was 0.54.

A single 40 item instrument, titled "My Science Class", was created by randomly combining items from the Individual and Group Attitudes Toward Science and the Measure of Classroom Structure. This was administered at the end of the school year. Information about the sex of student and teacher was also collected.

Results

The construct of classroom environment raises a major question about the appropriate unit of analysis. While it is certainly true that attitudes are held by, and idiosyncratic to, individual students, the same cannot be said for classroom environments. If climate exists, it does so at the level of the setting rather than at that of the student, and measures of individual perception are only secondary indicators of what that climate might be. Thus, while the

most meaningful unit of analysis for attitude may be the student, that is not the case for climate.

The same issue arises with regard to the teacher. Classrooms certainly vary along a number of parameters, and the environment of any single classroom must be the result of a complex set of interactions that are peculiar to that setting. However, it is also true that the teacher is a powerful actor in the establishment of both climate and attitude, and especially with regard to the kind of environmental variables that are being considered here.

For these reasons, the initial exploration of the relationships between enablement, alienation and attitude toward science are presented at three separate levels: the student, the classroom, and the teacher (Table 1). The results described are all statistically significant at levels beyond the 99% confidence interval ($p = 0.01$).

In the first analysis, individual scores for the entire sample of 2,159 subjects on the two subscales of the Measure of Classroom Structure are correlated with their scores on the Individual and Group Attitudes Toward Science instrument. The coefficient of correlation is 0.53 with the enablement subscale and -0.20 with the alienation subscale. Although both are statistically significant, the latter is relatively small. The direction of each is as expected; as enablement increases attitude also increases, and as alienation increases attitude decreases.

The strength of these relationships rises when the mean scores of classrooms are used in the calculation. At this level of

analysis, the correlation between enablement and attitude is 0.64 and the correlation between alienation and attitude is -0.52.

Perhaps the most enlightening relationship emerges when the unit of analysis is the teacher. The scores of all students of each teacher are averaged and the resulting means for each of the 19 teachers are used in the calculation. In this case, the coefficients of correlation rise respectively to 0.81 and -0.64. Despite the small sample size, the magnitudes of the correlations are remarkable, as are the scatter diagrams (Figure 1).

Since the variance among group means is normally smaller than the variance among individual scores, and since that quantity appears in the numerator of the equation for the coefficient of correlation, the use of group means will enlarge the value of the correlation. In this sense, the results above might be seen as an artifact of the procedure. But it is also true that the use of means has the salubrious effect of reducing the error variance, and thus allowing a better estimate of the relationship between variables. The variance shared between a sense of enablement and attitude toward science rises from 28% when the student is the unit of analysis to 66% when the teacher is the unit of analysis. The increase in the case of the relationship between alienation and attitude is from 4% to 41%.

There are significant differences in the way that males and females see their classes, as well as in the way all students perceive classes taught by male and female teachers. These results

are addressed by use of Analysis of Variance.

Female teachers appear to generate a greater feeling of involvement and consultation and less dissatisfaction on the part of students than is true of their male counterparts. There are significant main effects for teacher gender on both the Enablement, $F(1,2158)=30.73$, $p=.0001$, and Alienation, $F(1,2158)=62.10$, $p=.0001$, subscales of the Measure of Classroom Structure. Students of female teachers score higher on the former (Table 2) and lower on the latter (Table 3).

There are also significant main effects for gender of students on Enablement, $F(1,2158)=12.58$, $p=.0004$ and Alienation, $F(1,2158)=46.23$, $p=.0001$. On the whole, girls tend to see their classes as more enabling and less alienating than do boys.

While there are no significant interactions between gender of students and teacher, some trends are apparent. The highest perception of enablement is of females in classes taught by female teachers, and the lowest of males in classes taught by male teachers (Table 2). In a similar fashion, the lowest sense of alienation is among female students with female teachers, and the highest among male students with male teachers (Table 3).

There are no significant differences in the attitudes of male and female students toward science. However, students of female teachers have a significantly better attitude than those in classes taught by males , $F(1,2158)=13.93$, $p=.0002$. The poorest attitudes

are those held by female students in classes taught by male teachers (Table 4).

Discussion

Although the dimension tapped by the measure used in this study is a different one, the results reconfirm those of many earlier studies (Fraser & Butts, 1982; Talton & Simpson, 1987). Classroom climate is a powerful predictor of student attitudes.

The strength of this relationship is high enough to be considered remarkable. In a meta-analysis of research on attitude and achievement, Piburn (1992) was able to explain only 26% of the variance in attitude by use of a wide variety of cognitive and achievement factors. He found no average simple correlation between attitude and any other variable that was greater than 0.36. Yet, in this study, correlations were very high and, when the teacher was used as the unit of analysis 66% of the variance in the Enablement subtest and the attitude measure was shared. Even the second, and much weaker, Alienation subtest shared more variance with attitude than is usually the case of cognitive and achievement factors.

While it is tempting to think of the dimensions of classroom dynamic discussed here as reflecting the allocation of power between students and teacher, that is probably an incorrect interpretation. Power resides with teachers in classrooms, and it is a rare case indeed where students set the curriculum, establish classroom rules and award grades. And, in fact, there is no evidence from our

previous program of interviews that students would prefer it any other way. They expect teachers to provide a rich and rewarding environment, and to help them learn.

What students do wish is to be consulted. They want teachers to understand their needs and to consider them when making decisions about classroom matters. This appears to happen more often in primary than middle school or secondary classrooms. There is an almost perfect linear decline through the grades in student perceptions of enablement. Apparently primary school students see their classrooms as more open to their ideas than do students in middle schools.

The factor of alienation that has been revealed in this study also requires interpretation. Alienation and Enablement are not to be seen merely as the obverse of one another. Because of the statistical techniques that were used in their creation, they are factorially distinct, and thus uncorrelated. Neither does alienation imply anger or hostility. Rather, it seems to suggest that things have come adrift from the students' perspectives, and that they find themselves separated, or alienated, from the affairs of the classroom. Again, there is a dramatic increase in the sense of alienation through the grades.

The decline in attitude from earlier to later grades might at least in part be attributed to the shift from student-centered to teacher-centered classroom climate that seems to be part of the structure of elementary schools (Baker, et al.). If students see themselves as having influence in the classroom, if they are at one

with events and feel in tune with what is taking place, they have a much better attitude. Conversely, if they feel lost and sense that no-one is listening, their attitude is poorer.

Boys in this sample see themselves as less enabled than do girls, and students in classes taught by male teachers see themselves as exercising less control than those in classes taught by females. Links to attitude, while not as clear as in the earlier cases, can still be made. There are no gender differences in attitude among students, but classes taught by females are perceived as more student-centered, and the attitudes of students in those classes are more positive.

There is a newly emerging sense that males and females vary quite dramatically in preferred styles. Gilligan (1982) has led in suggesting that much of our research has been based upon male samples, and thus our models and theories are biased by the styles and characteristics preferred by men. This may especially be the case in terms of our understandings of classroom environments.

A major element of this newly constructed vantage point is that females appear to think of, and describe themselves, in terms of relationships. They dislike being isolated, and prefer working with others in cooperative problem-solving situations and their frames of reverence for identify and self-assessment are more external than internal (Baker & Leary 1993). Thus, they can be expected to seek input from others in structuring work situations, and to attend to the needs of others and guard against their isolation from the group.

This position is entirely consistent with the views of students, who feel more empowered and less alienated in classes taught by women than in those taught by men. Apparently female teachers structure their classrooms much more toward enabling situations than do male teachers. In general, female students see themselves as more a part of classroom events and are less alienated than is the case for males. This may result again from the pattern of female interactions, in which girls in the class seek out cooperative and interactive working situations to a much greater degree than do boys.

The general picture painted by the results of this study is a consistent one, and entirely in accord with interviews with students. Again and again they request more of a say in matters of classroom and curriculum. Students would like to be consulted regarding the content to be studied and the pedagogy to be employed, and they have very strong preferences. They also perceive the link to attitude. Following is a quote from one student interviewed in an earlier study (Piburn & Baker, in press):

> "It's them that's taking the class. It's them that are going to do all the work and earn the grades. And (if you aren't asked) it could ruin your whole attitude about it."

It appears from our study that the classroom climate established by the teacher is central to attitude development. If teachers care about attitude, they will have to listen more closely to the requests of students, and involve them in the decision-making process. This should lead to an increased feeling of enablement and less alienation on the part of their students. While that experiment has yet to be

performed, there is good reason to believe that an improvement in attitudes toward science would be a result.

References

Ahlgren, A. (1983). Sex differences in the correlates of cooperative and competitive school attitudes. Developmental Psychology, 19,(6), 881-888.

Ahlgren, A. & Johnson, D.W. (1979). Sex differences in cooperative and competitive attitudes from the 2nd through the 12th grades. Developmental Psychology, 15(1), 45-49.

Anderson, G.J. (1971). Effects of course content and teacher sex on the social climate of learning. American Educational Research Journal, 8, 649-663.

Anderson, G.J., Walberg, H.J. and Welch, W.W. (1969). Curriculum effects on the social climate of learning: A new representation of discriminant functions. American Educational Research Journal, 6, 315-327.

Baker, D., Hill, M., Leary, R., Moffatt, N., Piburn, M., Sidlik, L., Trammel, R. & Wallin, M. (1992). Letting students speak: A study of students' attitudes toward science. San Francisco, CA: American Educational Research Association.

Baker, D. & Leary, R. (1993). Letting girls speak out: Equity, school and social influences on career choice. Atlanta, GA: National Association for Research in Science Teaching.

Fraser, B.J. (1985). Individualized Classroom Environment Questionnaire. Melbourne: Australian Council for Educational Research.

Fraser, B.J. (1989). Learning environment research in science classrooms: Past progress and future prospects. Monograph #2, National Association for Research in Science Teaching.

Fraser, B.J., Anderson, G.J. & Walberg, H.J. (1982). Assessment of learning environments: Manual for Learning Environment Inventory (LEI) and My Class Inventory (MCI). (third edition). Perth: Western Australian Institute of Technology.

Fraser, B.J. & Butts, W.L. (1982). Relationship between perceived level of classroom individualization and science related attitudes. Journal of Research in Science Teaching, 19(2), 143-154.

Fraser, B.J. & Fisher, D.L. (1982). Predicting students' outcomes from their perceptions of classroom psychosocial environment. American Educational Research Journal, 19(4), 498-518.

Fraser, B.J. & Fisher, D.L. (1983). Use of actual and preferred classroom environment scales in person-environment fit research. Journal of Educational Psychology, 75(2), 303-313.

Fraser, B.J. & Rentoul, A.J. (1980). Person-environment fit in open classrooms. Journal of Educational Research, 73, 159-167.

Fraser, B.J. & Fisher, D.L. (1986). Using short forms of classroom climate instru;ments to assess and improve classroom psychosocial environment. Journal of Research in Science Teaching, 5, 387-413.

Fraser, B. and Rentoul, A.J. (1982). Relationship between school-level and classroom-level environment. Alberta Journal of Educational Research, 28, 212-225.

Gilligan, C. (1982). In a different voice. Cambridge, MA: Harvard University Press.

Haladyna, T. & Shaughnessy, J. (1982). Attitudes toward science: A quantitative synthesis. Science Education, 66(4), 547-563.

Lawrenz, F.P. (1976). Student perception of the classroom learning environment in biology, chemistry and physics courses. Journal of Research in Science Teaching. 13, 351-353.

Lawrenz, F. (1987). Gender effects for student perception of them classroom psychosocial environment. Journal of Research in Science Teaching, 24(8). 689-697.

Lawrenz, F. & Welch, W.W. (1983). Student perceptions of science classes taught by males and females. Journal of Research in Science Teaching, 20(7), 655-662.

Moos, R.H. (1968). The assessment of the social climates of correctional institutions. Journal of Research in Crime and Delinquency, 5, 174-188.

Myers, R.E. & Fouts, J.T. (1992). A cluster analysis of high school science classroom environments and attitude toward science. Journal of Research in Science Teaching, 29(9), 929-938.

Piburn, M.D. (June, 1992). Meta-analytic and multivariate procedures for the study of attitude and achievement in science. Dortmund, Germany: International Council for Associations of Science Education.

Piburn, M. & Baker, D. (in press). IF I WERE THE TEACHER: A qualitative study of attitude toward science. Science Education.

Piburn, M., Sidlik, L. & Mulvenon, S. (1992). Reliability and validity of two measures of attitude toward science. Boston, MA: National Association for Research in Science Teaching.

Simpson, R.D. & Oliver, J.S. (1990). A summary of major influences on attitude toward and achievement in science among adolescent students. Science Education, 74(1), 1-18.

Talton, E.L. & Simpson, R.D. (1986). Relationships of attitude towards self, family and school with attitude toward science among adolescents. Science Education, 70(4), 365-374.

Talton, E.L. & Simpson, R.D. (1987). Relationships of attitude toward classroom environment with attitude toward and achievement in science among tenth grade biology students. Journal of Research in Science Teaching, 24(6), 507-526.

Trickett, E.J. & Moos, R.H. (1973). Social environment of junior high ahd high school classrooms. Journal of Educational Psychology, 65, 93-102.

Walberg, H.J. (1968). Teacher personality and classroom climate. Psychology in the Schools, 5, 163-169.

Walberg, H.J. (1968). Structured and affective aspects of classroom climate. Psychology in the Schools, 5, 247-253.

Walberg, H.J., & Anderson, C.J. (1968). Classroom climate and individual learning. Journal of Educational Psychology, 59, 414-419.

Welch, W.W. and Lawrenz, F. (1982). Characteristics of male and female science teachers. Journal of Research in Science Teaching, 19(7), 587-594.

Yamamoto, K., Thomas, E.C., & Karns, E.A. (1969). School-related attitudes in middle-school age students. American Educational Research Journal, 6, 191-206.

Table 1. Correlations between student scores on Individual and Group Attitudes Toward Science and the Enablement and Alienation subscales of the Measure of Classroom Structure

	Unit of Analysis	Enablement	Alienation
Attitude	Student	.53	-.20
	Classroom	.64	-.52
	Teacher	.81	-.64

Table 2. Mean scores on Subscale 1: Enablement of the Measure of Classroom Structure for male and female students in classes taught by male and female teachers

		TEACHERS	
		Male	Female
STUDENTS	Male	28.1 (8.0)	29.5 (8.2)
	Female	28.8 (8.0)	31.5 (7.7)

(Standard Deviation)

Table 3. Mean scores on Subscale 2: Alienation of the Measure of Classroom Structure for male and female students in classes taught by male and female teachers

		TEACHERS	
		Male	Female
STUDENTS	Male	23.6 (5.9)	21.6 (6.1)
	Female	22.1 (5.3)	19.9 (5.4)

(Standard Deviation)

Table 4. Total scores on Individual and Group Attitudes Toward Science for male and female students in classes taught by male and female teachers

		TEACHERS	
		Male	Female
STUDENTS	Male	61.9 (10.5)	62.9 (10.5)
	Female	60.4 (11.0)	63.0 (10.0)

(Standard Deviation)

APPENDIX I: Measure of Classroom Structure

Think about the class you are in <u>this period</u>. Next to each item is a line with ten spaces. Place a "X" in the space that you think describes your class best.

If you agree completely that the item describes your class, place an "X" in the space at the far right:

DISAGREE AGREE

/_/_/_/_/_/_/_/_/_/_/

If you disagree completely that an item describes your class, place an "X" in the space at the far left:

DISAGREE AGREE

/_/_/_/_/_/_/_/_/_/_/

Otherwise, place the check in a space somewhere between AGREE and DISAGREE.

Go ahead and finish the questionnaire now

ENABLE

	DISAGREE AGREE
1) Students in this class work on the same activities at the same time.(2)*	/_/_/_/_/_/_/_/_/_/_/
2) People in this class compete with each other to see who is best.(2)	/_/_/_/_/_/_/_/_/_/_/
3) Students' ideas and suggestions are used during classroom discussions.(1)	/_/_/_/_/_/_/_/_/_/_/
4) Different students use different books, equipment and materials.(2)	/_/_/_/_/_/_/_/_/_/_/
5) The teacher tries to find out what each student wants to learn about.(1)	/_/_/_/_/_/_/_/_/_/_/
6) The teacher makes the rules and they seem to change a lot.(2)	/_/_/_/_/_/_/_/_/_/_/
7) Class decisions tend to be made by all of the students.(1)	/_/_/_/_/_/_/_/_/_/_/
8) Students can discuss the rules in this class with the teacher.(1)	/_/_/_/_/_/_/_/_/_/_/
9) Students are encouraged to work against each other in this class.(2)	/_/_/_/_/_/_/_/_/_/_/
10) When students are finished with their work, they are expected to help others.(1)	/_/_/_/_/_/_/_/_/_/_/
11) We get opportunities to talk and work with other students.(1)	/_/_/_/_/_/_/_/_/_/_/
12) The better students in this class are granted special privileges.(2)	/_/_/_/_/_/_/_/_/_/_/
13) Students conduct investigations to test ideas and answer the teacher's questions.(1)	/_/_/_/_/_/_/_/_/_/_/
14) The teacher rewards those who work hard to achieve the highest grade.(2) *	/_/_/_/_/_/_/_/_/_/_/
15) Each member of the class has as much influence as each other member.(1)	/_/_/_/_/_/_/_/_/_/_/
16) The students in this class don't know each other very well.(2)	/_/_/_/_/_/_/_/_/_/_/
17) All students are expected to do the same amount of work for the same lesson.(2)*	/_/_/_/_/_/_/_/_/_/_/
18) Decisions affecting the class tend to be made democratically.(1)	/_/_/_/_/_/_/_/_/_/_/
19) Students have to guess what the teacher wants accomplished in this class.(2)	/_/_/_/_/_/_/_/_/_/_/
20) The teacher remains at the front of the class rather than moving around and talking with students.(1)*	/_/_/_/_/_/_/_/_/_/_/

(1) Subtest: ENABLEMENT
(2) Subtest: ALIENATION

* Reverse score